

A futuristic cafe scene with people and robots. In the foreground, a man with glasses is seated at a table, smiling and talking to a woman. To his left, a white robot with a large head and glowing green eyes is seated at the table. In the background, another person is seated at a table, and a woman is standing. The cafe has a modern, warm atmosphere with wooden tables and chairs, and large windows with greenery outside.

Siggraph 2022 - EMERGING TECHNOLOGIES

# Meta Avatar Robot Cafe:

*Linking Physical and Virtual Cybernetic Avatars to Provide Physical Augmentation for People with Disabilities*

**Keywords:** cybernetic avatar, avatar works, telepresence robot, people with disabilities, human-robot interaction

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# Meta Avatar Robot Cafe: Linking Physical and Virtual Cybernetic Avatars to Provide Physical Augmentation for People with Disabilities

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(a) (a) Avatar robot cafe DAWN ver.  $\beta$ .



(b) (b) AR operation (©UTJ/UCL)



(c) (c) VR operation

# AUTHORS



## Yoichi Yamazaki

神奈川工科大学

研究領域：智能家居、人機互動

Yoichi Yamazaki joined Kanagawa Institute of Technology in 2013. Currently, he is Associate Professor of Department of Home Electronics at Kanagawa Institute of Technology, where he is mainly involved in the research fields of communication robotics, home electronic system, mentality expression, and human-robot interaction.

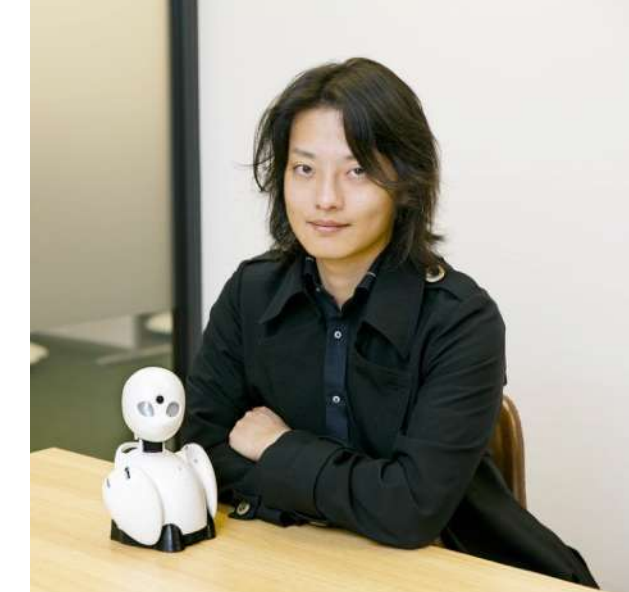


## Ryuma Niiyama

明治大學

研究領域：充氣機器人、連續控制

Ryuma Niiyama's current research interests include bio-inspired robots, continuum manipulators, and inflatable robots. He is one of the project directors of the JSPS Grant-in-Aid for Scientific Research on Innovative Areas "Science of Soft Robots," a large research project related to soft robotics in Japan.



## Kentaro Yoshifuji

ORY實驗室（公司）

研究領域：替身機器人應用

Kentaro Yoshifuji went to Waseda University School of Science and Engineering, developed the notion of "OriHime", an avatar communication robot to combat loneliness. This led to establishment of Ory Laboratory Co., Ltd. a company that aims to decimate the avatar robot notion to as many people that can benefit from it as possible.

# ABSTRACT

Meta avatar robot cafe is a cafe that fuses **cyberspace** and **physical space** to create new encounters with people. We create a place where people with **disabilities** who have difficulty going out can freely **switch between their physical bodies and virtual bodies**, and communicate their presence and warmth to each other.

# KEYWORDS

cybernetic avatar, avatar works, telepresence robot, people with disabilities, human-robot interaction

# CCS CONCEPTS

- **Computer systems organization**  
→ Robotics; Robotics;
- **Human-centered computing**  
→ Interaction design theory, concepts and paradigms;
- **Social and professional topics**  
→ People with disabilities.

- **研究主題：**  
替身機器人、遠端呈現、人-機器人交互
- **目標人群&社會關照：**  
居家殘疾人
- **應用場景：**  
咖啡廳

1 INTRODUCTION

2 META AVATAR ROBOT CAFE

3 DEMONSTRATION AT THE AVATAR ROBOT CAFE DAWN VER.β

4 CONCLUSIONS

# 1 INTRODUCTION

The benefits of telepresence robots go beyond the ability for people to move around instantly. They have the potential to **extend a person's physical capabilities**; **AR and VR avatars** can further extend their abilities and even move beyond their real physical limits. This is very attractive and important, especially for people with disabilities. Our mission is to **solve loneliness through technology**. We have developed an avatar robot system that enables people who have given up communication due to disabilities to **work from home**

- **遠端呈現的優點：**  
擴展人類身體能力
- **AR & VR替身：**  
突破現實的物理限制→殘疾人
- **目標：**  
用科技解決孤獨
- **方式：**  
讓因為殘疾而放棄社交的人，  
得以居家工作。
- **方案：**  
咖啡廳（運營中） +  
替身機器人系統  
（在家操控咖啡廳的機器人、  
在兩種形式的替身間切換）

# 1 INTRODUCTION

We also prepare and an **Avatar robot cafe** the avatar work, which is already in operation in Japan (Figure 1: (a)) [Inc. 2021]. The pilot controls the robot from his/her home by operating an application on a tablet or PC supported according to his/her disability (Figure 2).



(a) (a) Avatar robot cafe DAWN ver.  $\beta$ .

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# 1 INTRODUCTION

where an operator (we call him or her "pilot") selectively switches between **two types of avatar robots** via the Internet [Takeuchi et al. 2020].

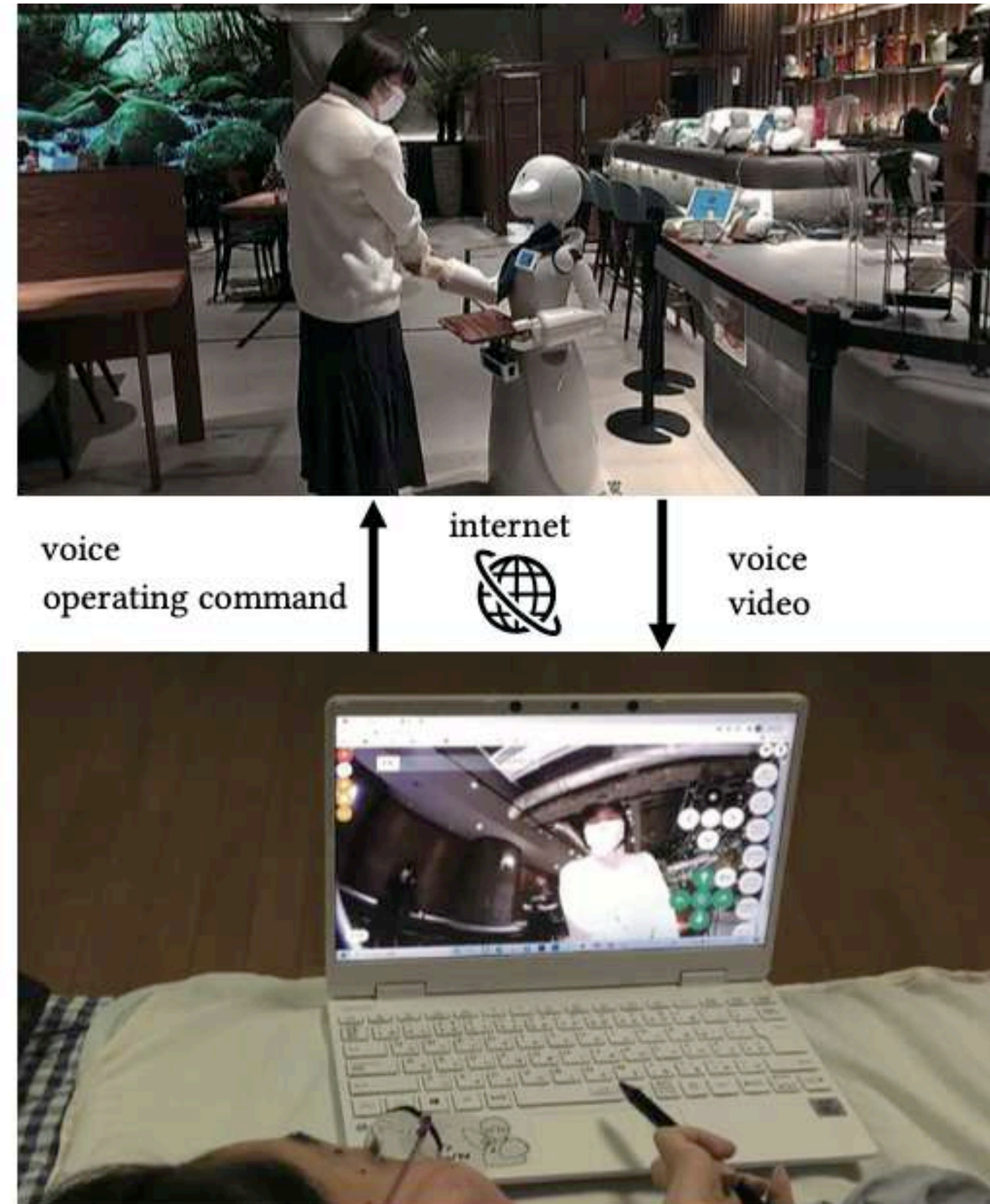


Figure 2: Operation of the avatar robot OriHime-D by a pilot with disabilities at the Avatar robot cafe.

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## 2 META AVATAR ROBOT CAFE

One of the important aspects of telepresence robots is to **share experiences with others in real world**. Sharing the experience in real world with others makes the remote location feel real and in the moment. With a physical avatar robot, the pilot can feel that he or she is in the cafe for real through serving customers there by remote control. This is a great advantage for people with disabilities who have difficulty going out. On the other hand, the robot is subject to physical limitations on its movements. For safety reasons, **robots are restricted in their active movements.**

- **替身機器人的一個重點：**  
真實世界的經驗分享  
真實、當下感  
→由物理機器人提供
- **替身機器人的限制：**  
因安全考量，機器人動作受限
- **解決方案：**  
AR & VR應用  
得以做出華麗的動作，如：  
跳舞、踢腿...

## 2 META AVATAR ROBOT CAFE

To solve this limitation problem, we have prepared an AR avatar. **AR and VR applications** can extend physical capabilities beyond robots. Flashy movements like dancing and kicking, which are never possible with their real body, are popular motions for the pilots.



(b) (b) AR operation (©UTJ/UCL)



(c) (c) VR operation

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跳舞、踢腿...  
(殘疾人不可能完成的動作)

### 3 DEMONSTRATION AT THE AVATAR ROBOT CAFE DAWN VER.β

The most important thing to remember about the Meta Avatar robot cafe is that AR, VR and the real space cafe **mean exactly the same thing to a pilot operating from a remote location.** This may seem obvious, but it is a very important realization. **For the pilot, there is no sensory difference between the physical robot body and the AR avatar body,** as long as they can operate from the same screen. They can freely change and manipulate the body according to what they want to do. As one example, a bedridden person with a disability said that **he sat in a chair for the first time in several years after controlling his avatar. This kind of experience is difficult to achieve with telep-resence robots alone.** This experience could only have been realized by using a physical robot to interact with a person and gain a sense of reality at a distance, and then switching to an AR or VR avatar free from movement restrictions.

- **整合體驗：**  
機器人替身與AR替身在操作端的感受相同。  
自由、流暢的整合體驗才能讓使用者有身臨其境的感覺。  
使用者反饋：在控制替身時，第一次有了“坐”進一張椅子的感受。

## 4 CONCLUSIONS

In addition to the telepresence robot, the Meta Avatar robot cafe has **a VR space** that is connected to reality, and **a social system** of working at the cafe all in one set. That is why we were able to realize this kind of experience by people with disabilities. We believe this is the major value of the Meta Avatar robot cafe. We believe that if we can provide the technology to **switch between various physical and virtual avatars** with different characteristics and their social environment, we can realize a society in which **people can participate in various social activities** even if they become bedridden.

- **附加：**  
VR空間、社交系統
- **信念：**  
技術實現實體 & 虛擬替身  
臥床不起的民眾得以參與社交

# Connection

PRIX ARS ELECTRONICA 2022\_Digital Communities\_Golden Nica  
<https://calls.ars.electronica.art/2022/prix/winners/9194/>

What makes the Avatar Robot Café DAWN ver.β outstanding is how it stimulates us to think in novel ways how socio-technological arrangements can **enable (marginalized) people to participate in communities**. Particularly in times where people are **seduced into commercialized and unsustainable virtual worlds**, we should think about other forms of resilient community-enabling arrangements. Both in terms of the self-evident integration of **vulnerable groups into society**, as well as **the design, the culinary arts, and the interaction** between (wo)man and machine, the Avatar Robot Cafe DAWN ver.β is an outstanding project and from the jury's point of view **a prime example of what a digital community can do and achieve.**

# Connection

## Ory Laboratory: OriHime, OriHime eye and OriHime-D

### OriHime

The Avatar robot OriHime, is a communication tool that was created to help realize the conventional social aspects of life and work. More notably to solve the "restrictions posed on movement" caused by hospitalization, physical disability, etc.



### OriHime eye

OriHime eye is a communication device for severely physically handicapped patients who can only move their eyes, fingertips and have other very limited range of movements. PC controlling can be done smoothly with our simple operation system, a software which reproduces a transparent analog keyboard on the screen.



### OriHime-D

OriHime-D is a 120cm tall avatar robot. Which was designed to allow people, who are working from home, to be able to carry out work that involves physical labor such as waiting on costumers, bringing things from A-B, helping people and so forth.

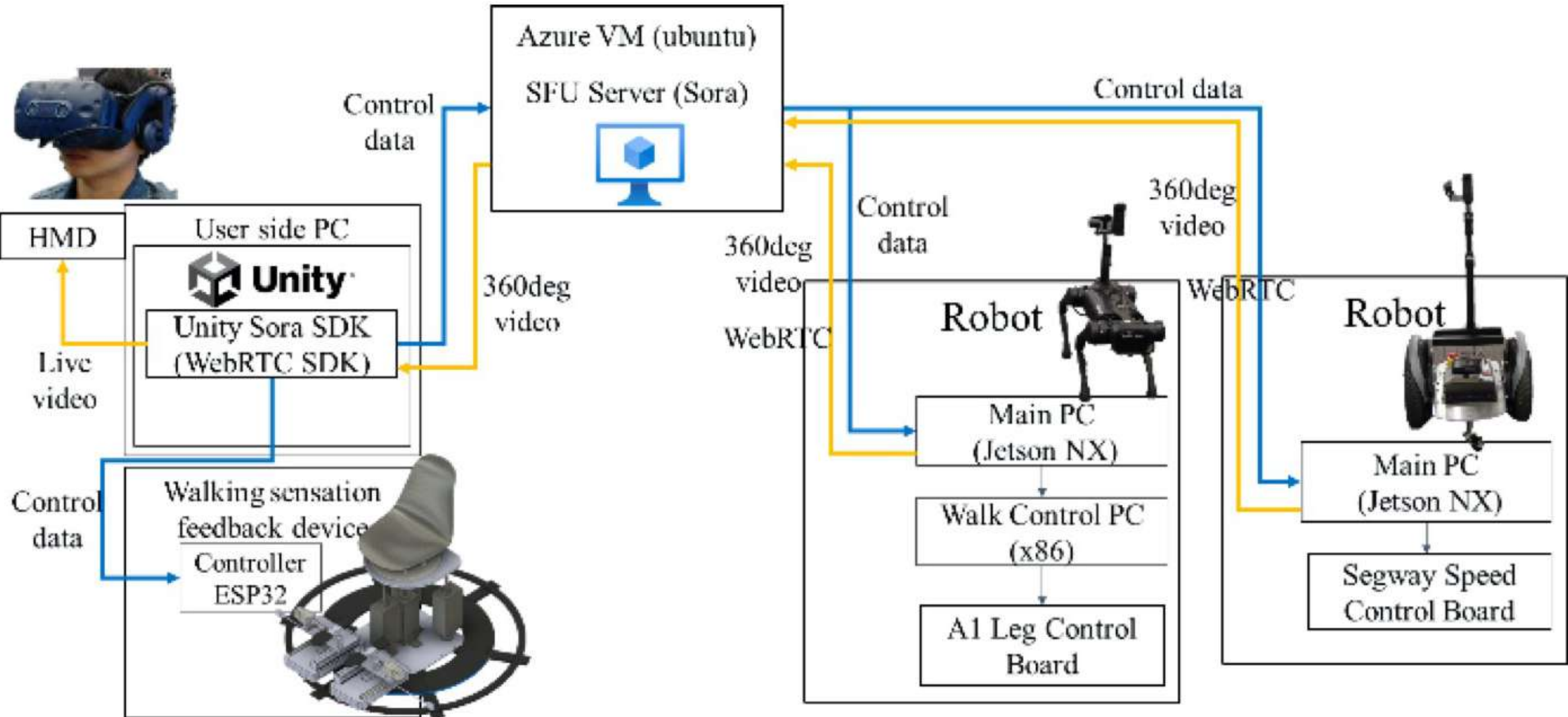


# Connection

SIGGRAPH '22: ACM SIGGRAPH 2022 Emerging Technologies

## Dual Robot Avatar: Real-time Multispace Experience using Telepresence Robots and Walk Sensation Feedback including Viewpoint Sharing for Immersive Virtual Tours

<https://dl.acm.org/doi/10.1145/3532721.3535570>



# Connection

## Telepresence and Interactive Art Works-Eduardo Kac

cyberspace, virtual reality, and telepresence

[https://ekac.org/telepresence.art.\\_94.html](https://ekac.org/telepresence.art._94.html)

<https://ekac.org/interactive.html>



### The Telepresence Garment

1995/96

The Telepresence Garment was first experienced in the context of the IV St. Petersburg Biennial, Russia, 1996. Apparel and apparatus merge in this networked interactive article of clothing.



### RC Robot

1986

In 1986 Kac worked with radio-controlled telerobotics in the context of the exhibition "Brasil High Tech", realized at the Centro Empresarial Rio, in Rio de Janeiro. Kac used a 7-foot tall anthropomorphic robot (left) as a host who conversed with exhibition visitors in real time. The robot's voice was that of a human being transmitted via radio. Exhibition visitors did not see the telerobot operator, who was telepresent on the RC Robot's body.

Still in the context of the exhibition, the robot was used in a dialogical performance realized with Otavio Donasci, in which the robot interacted with Donasci's videocreature. Through the robotic body, a human (hidden away) improvised responses to the videocreature's pre-recorded utterances.

The robot was built by Cristovão Batista da Silva.



# Comments

1. 社會關照
2. 執行力與完成度
3. 打破動作限制、整合體驗: human-centered computing



# Thank You!

## references:

OryLab Inc. - オリィ研究所

<https://orylab.com/en/>

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<https://dl.acm.org/doi/proceedings/10.1145/3532721>